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June 28, 2007 *Also Sent Via E-mail*

Mr. Robert J. Wyatt
Northwest Natural Gas Company
220 N.W. Second Avenue
Portland, OR 97209

Re: Phase 2 Offshore Field Sampling Approach
Groundwater Source Evaluation
Northwest Natural Gas Company Site
Portland, Oregon
ECSI #84

Dear Mr. Wyatt:

The Oregon Department of Environmental Quality (DEQ) has reviewed the "Phase 1 Report and Phase 2 Field Sampling Approach, GASCO Siltronic Groundwater Source Evaluation" dated May 2007 (Phase 1 Report/Phase 2 FSA). Anchor Environmental, LLC (Anchor) prepared the Phase 1 Report/Phase 2 FSA on behalf of the Northwest Natural Gas Company (NWNG).

NWNG is currently engaged in ongoing investigations of manufactured gas plant (MGP) waste and associated contamination in the uplands of their property (NWNG Property, aka the "Gasco Site") and the adjoining Siltronic Corporation property (Siltronic Property). In addition, NWNG is conducting in-water investigations offshore of the Gasco Site and the northern portion of the Siltronic Property to support the Portland Harbor in-water remedial investigation and feasibility study (RI/FS) being performed by the Lower Willamette Group (LWG). The results of the in-water work will also provide information to: 1) further assess uplands contaminant transport pathways (e.g., direct discharge, groundwater) as sources of contamination to the river; 2) support uplands source control measures evaluations and designs for the both facilities; and 3) assist planning of in-water work being contemplated by the US Environmental Protection Agency (EPA).

NWNG is conducting in-water investigatory work in phases. The Phase 1 offshore field sampling approach (Phase 1 FSA) was completed earlier this year with the purpose of collecting groundwater chemistry data and general geotechnical information in the near shore area along the Gasco Site and the northern portion of the Siltronic Property to: 1) assess the lateral and vertical extent of site-related contamination in groundwater along the Gasco Site shoreline for comparison to data collected in the upland; and 2) collect information on subsurface geotechnical conditions to support source control measures evaluations, including a vertical barrier; and 3) provide data to develop the in-water sampling and analytical program for the Phase 2 offshore field sampling approach (Phase 2 FSA).

The Phase 2 FSA is scheduled to begin in early July after the opening of the season's first fish window. NWNG's primary objectives for the Phase 2 FSA include: 1) assessing the nature and extent of MGP impacts in TZW and groundwater beneath the river and their relationship to upland groundwater contamination; 2) evaluating the distributions of chemicals detected in TZW and how they relate to historical direct discharge and deposition of MGP waste in the river; and 3) developing an understanding of where historical discharges and/or deposition of MGP waste have impacted biologically active TZW in navigation channel sediments.

The Phase 2 FSA is organized into two "steps." Step 1 will provide data to assess TZW and shallow groundwater chemistry beneath the Willamette River in the area of investigation. Based on the results of Step 1, the Step 2 field program will be developed. During Step 2 deep boring locations will be selected and sediment and groundwater sampling will be conducted down to the basalt. Data collected during Step 2 will be used to evaluate the relationship between uplands groundwater contamination and impacts detected under the river.

The Phase 1 Report/Phase 2 FSA provides:

- The results of work completed during the Phase 1 FSA including, drilling and sampling one upland boring and twelve near shore borings along the shoreline of the NWNG Property and the northern portion of the Siltronic Property; and
- A work plan for the Phase 2 FSA including, in-water sediment, TZW, and groundwater sampling offshore of the Gasco Site and northern portion of the Siltronic Property.

This letter focuses primarily on DEQ's review of the Phase 2 FSA. DEQ is not providing detailed comments regarding the Phase 1 Report at this time. DEQ understands that NWNG will compile the results of the Phase 1 and Phase 2 FSAs and present interpretations of the combined datasets in a single document prepared subsequent to completion of the Phase 2 FSA field work.

DEQ's general comments to the Phase 1 Report, our conditions for implementing the Phase 2 FSA, and our comments to the Phase 2 FSA are provided below. NWNG and DEQ discussed the conditions and comments regarding the Phase 2 FSA in detail during a meeting on June 25, 2007.

PHASE 1 REPORT

DEQ acknowledges that the Phase 1 FSA was completed consistent with agreements reached with NWNG[1], and that the data collection objectives of the project were met. DEQ's general comments to the Phase 1 Report are provided below to clarify our expectations for future reporting.

- NWNG has identified benzene, naphthalene, and cyanide (i.e., total, amenable, and free

[1] Anchor Environmental, LLC, 2006, "Final Phase 1 Field Sampling Approach, GASCO Siltronic Groundwater Source Evaluation", September (as amended by: 1] the "Addendum to Offshore Final Phase I Field Sampling Approach, NW Natural, Gasco Site, Portland, Oregon", September 29; and 2] "Addendum 2 to Final Phase 1 Field Sampling Approach, Groundwater Source Evaluation, Northwest Natural Gas Company Site, Portland, Oregon," December 28). A work plan prepared on behalf of the Northwest Natural Gas Company.

forms) as "key constituents" to use in assessing groundwater contamination associated with MGP waste. NWNG should be advised that DEQ does not consider these analytes adequate for delineating the nature and extent of contamination. For example, relevant ecological criteria for toluene, ethylbenzene, and xylenes are lower than benzene. DEQ expects NWNG to fully evaluate the nature and extent all MGP waste chemicals of interest (COI) in the "DNAPL/contaminated groundwater" focused feasibility study (FFS).

- Based on DEQ's review of Table 3 it appears NWNG relied on "dissolved" concentrations of naphthalene to prepare Figure 5b. This approach is not acceptable to DEQ. In the future figures depicting the interpreted horizontal and/or vertical distribution of COI should utilize "total" concentrations.
- During the Phase 1 FSA, groundwater and sediment samples were analyzed for total, amenable, and free forms of cyanide. NWNG notes that the cyanide aquatic toxicity criteria are based on the concentration of "free" cyanide and focuses discussions of cyanide data on this form. NWNG should be advised that DEQ considers the EPA's National Recommended Water Quality Criteria for human health and fish consumption for "total" cyanide of 140 micrograms per liter to be relevant for reviewing and screening analytical data.

DEQ anticipates that data generated during the Phase 1 and Phase 2 FSAs will be compiled and presented in a single document, and will review data descriptions and interpretations in more detail at that time.

PHASE 2 FIELD SAMPLING APPROACH

DEQ approves implementing the Phase 2 FSA under the following conditions:

- Step 1 proposes analyzing transition zone water (TZW) and shallow groundwater samples for volatile organic compounds (VOCs) and cyanide (i.e., total, amenable, and free forms). DEQ understands that NWNG intends to expedite sample analysis for these chemicals to support decisions regarding the locations of Step 2 borings. However, DEQ considers the proposed analyte list to be inadequate to achieve the data collection goals of the project. DEQ will require the Step 1 suite of analyses to be expanded to include all of the COI identified at the Gasco Site, including polycyclic aromatic hydrocarbons (PAHs) and metals (see tables 9a and 9b). DEQ understands from the June 25th meeting that all of the analyses of PAHs and metals may not be complete when planning for Step 2 is initiated; however DEQ considers this data essential to meet the overall objectives of the project.
- NWNG proposes collecting sediment samples for analysis at the Step 2 borings. As mentioned above, the locations of the Step 2 borings will be determined based on the results of analyzing samples collected during Step 1. DEQ will require that NWNG analyze sediment samples collected during Step 2 for diesel-range and residual range petroleum hydrocarbons using the NWTPH-Dx analytical method. This information will be used to assess the total concentrations of petroleum hydrocarbons in sediments and will supplement the sediment data for individual constituents of MGP waste (e.g., benzene, toluene, ethylbenzene, and xylenes, and PAHs).
- DEQ concurs with NWNG that the focus of the Phase 2 FSA is to assess the nature and extent of TZW and groundwater contamination beyond the shoreline. However, based on the

limited offshore groundwater data currently available, the horizontal and vertical variability of groundwater contamination interpreted in the uplands and near shore areas, and the timeframe for conducting field work, DEQ considers it unlikely that the Phase 2 FSA will produce sufficient data to quantify or definitively determine the extent and magnitude of groundwater contaminant discharges to the river. For these reasons, DEQ views the overall goal of Step2 to be collecting data to assess the fate and transport of COI along the axes of uplands groundwater plumes projected offshore. Step 1 boring locations should be adjusted with this goal in mind (i.e., transect B and C boring locations should be adjusted to position borings at or nearer the downstream NWNG property line and offshore of near shore borings GS-02 and GS-03).

- Consistent with DEQ's letter dated December 15, 2005, selected groundwater samples should be analyzed for chlorinated herbicides, chlorinated dibenzo-p-dioxins, and chlorinated dibenzofurans. DEQ expects at least two groundwater samples to be collected for this purpose during Step 2. The samples should be collected at depth from the upstream-most borings located on transects B and C.
- There is the possibility that highly contaminated sediments could be encountered at shallow depths during drilling along transects B and C. If this is the case, the double-case method of drilling should be employed during Step 2 to reduce the potential for impacted shallow sediments to be carried down the borehole during drilling and bias the results of the samples collected at depth. Using this drilling method could improve the comparability of this data to uplands groundwater data and assist in distinguishing between shallow groundwater impacts from historical direct discharge to the river, and contamination associated with groundwater transport.
- The presence and occurrence of dense non-aqueous phase liquids (DNAPLs) in subsurface material should be a data collection objective of the Phase 2 FSA. Close attention should be paid for visual evidence of DNAPL in sediment. DEQ also expects all cored geologic material collected during Step 2 to be screened in the field using methods appropriate for MGP waste (e.g., ultraviolet fluorescence).

DEQ expects NWNG to incorporate the conditions listed above into the Phase 2 FSA field program.

ADDITIONAL COMMENTS

Section 3.1.1. NWNG proposes meeting with DEQ to review and discuss the results of Step 1 and determining the locations for Step 2 borings. NWNG should be advised that DEQ will invite representatives of EPA and members of the Portland Harbor Technical Coordinating Team to participate in this meeting.

Section 3.2. As discussed under the conditions above, DEQ is requiring NWNG to analyze Step 1 and Step 2 TZW and groundwater samples for all site COI. Consistent with the prioritization scheme used during the Phase 1 FSA, sample collection should be based on the location of the boring and the anticipated contamination. For example, samples should be collected from borings located offshore of borings GS-05 through GS-12 in the order of VOCs, PAHs, cyanide

(total, amenable, and free forms), metals, and ammonia. Samples collected offshore from borings GS-01 through GS-04 should collect cyanide (total, amenable, and free forms), VOCs, PAHs, ammonia, and metals in order.

Section 3.5. DEQ understands that the transducer described in the last paragraph of this section will be in-place during the entire Phase 2 FSA. DEQ anticipates the frequency of transducer measurements will allow the elevation of the river to be determined at the time each TZW or groundwater sample is collected.

This information will be used to preliminarily assess the potential for tidal fluctuations to influence the chemistry of TZW samples (i.e., assess potential inverse relationship between COI concentrations and river stage). Using the findings of Step 1, DEQ expects NWNG to develop an approach for further assessing the influence of tidal fluctuations on TZW chemistry during Step 2.

Section 3.6.1, 1st paragraph. NWNG proposes using push-probe drilling and sampling equipment to collect TZW and groundwater samples during steps 1 and 2. Prior to initiating the Step 1, DEQ understands that a plate will be attached to the end of a section of drill casing. The casing/plate combination is designed to minimize: 1) the depth the casing sinks into river sediments, and 2) short-circuiting of river water into the sample collection interval. Immediately prior to initiating sampling, the casing/plate combination will be lowered through the water column until it comes to rest on the river bottom. The plate will serve as the basis for determining sample collection depth intervals (i.e., the plate equals "zero" feet below mudline [bml]).

Groundwater and TZW sampling will be conducted by lowering a screened sampling device through the casing and then pushing it into sediments. The sampling device will be covered by a retractable sleeve that covers and seals the screen to prevent contact with sediment and water. Upon reaching the target depth interval, the sleeve will be retracted exposing the screen to the formation for purposes of sampling.

Using the methods and procedures described above, DEQ considers placement of the screen to be the most critical factor in collecting TZW samples. As discussed on June 25th, DEQ will require that the top of the exposed screen be set between 1.0 to 1.5 feet below the bottom of the casing/plate combination. DEQ expects this measurement to be documented at each Step 1 boring location.

As we indicated on June 25th, DEQ will also require the deep groundwater sample at each Step 1 boring to be collected from a depth interval of 13 to 15 feet bml. The Phase 2 FSA proposes these samples be collected from 10 to 12 feet bml. Collecting samples from the deeper interval could assist in distinguishing TZW contamination from groundwater versus historical MGP waste direct discharge/deposition.

Section 3.6.1, 2nd paragraph. NWNG indicates the Step 2 drilling program may include 6 deep borings. DEQ has previously informed NWNG that without having the results of Step 1 drilling and sampling work, it is premature to determine the numbers of Step 2 borings.

Section 3.6.1, 3rd paragraph. As noted above additional water may need to be removed from the outer casing prior to purging the rods for the TZW sample at each Step 1 boring location.

Given that a data collection objective of the Phase 2 FSA is to assess the fate and transport of COI along flowpaths across transects A, B, C, and D, DEQ expects dissolved oxygen (DO) and oxidation-reduction potential (ORP) to be added to the list of field water quality parameters. Many of the COI, notably cyanide, are sensitive to these parameters. A flow-through cell will provide the most representative field measurements of DO and ORP, as well as pH, specific conductance, and temperature.

Section 3.6.4. For completeness DEQ requests that NWNG provide a copy of ASTM standard D2488-00 to document borehole logging procedures and soil descriptions for the project.

Section 3.7. This section of the Phase 2 FSA briefly describes the measures that NWNG will use to prevent and control spills onto the barge deck and/or into the river during over-water drilling and sampling activities. DEQ expects that procedures will be consistent with those developed, approved, and used during the Phase 1 FSA.

Based on observations made during the Phase 1 FSA, DEQ recommends the following refinements be made to on the barge spill prevention and control procedures.

- Bermed secondary containment should be provided for the entire drill rig and sampling handling area(s) on the barge to prevent minor releases of hydraulic and/or lubricating oil, antifreeze, sample material from running off of the deck.
- Although not detailed in the Phase 2 SAP, DEQ expects the configuration of booms deployed in the river to be consistent with the approach developed during the Phase 1 FSA. Deployment will include (from inner-most to outer-most: 1) sorbent booms that encircle the drilling casing; 2) sorbent booms that surround the barge (including the spuds) and work area (i.e., area beneath the drilling platform); and 3) a containment boom that encloses the barge and prevents releases could occur outside the sorbent boomed area, if any, form escaping to the river. In addition, an inventory of available sorbent pads/booms should be checked prior to initiating work and each day thereafter to ensure that sufficient quantities of each are available and ready for immediate use if needed.

Section 3.8.4. DEQ understands that disposable gloves will be changed frequently during the processing of each individual groundwater or sediment sample to prevent cross-contamination of sampling equipment or sample containers.

Section 3.8.5. It is unclear to DEQ whether TZW and groundwater sampling equipment decontamination procedures are described in this section of the Phase 2 FSA. For example, cleaning and decontamination of the HydroPunch™ sampling device required use of a high-

pressure hot water washer. NWNG should clarify whether these procedures are included, and if not they should be provided.

In the event heavily impacted soil/sediment and/or groundwater is encountered during drilling, decontamination of sample collection equipment may be difficult. DEQ requests that in these cases sampling equipment (e.g., pump tubing) be replaced rather than decontaminated and reused. This will reduce the amount of investigation derived waste produced from decontamination and make it easier to manage and secure the discarded items.

Tables 7, 8, and 9. These three tables should be revised consistent with the conditions and comments listed above. Regarding tables 8 and 9, it does not appear that ammonia has been included in the analyte lists. These tables should be revised accordingly.

DEQ expects that 10% of the deeper groundwater samples collected during Step 1 will be analyzed for "dissolved" metals for comparison to total metals data. DEQ recommends that dissolved metals be analyzed for in the first and fourth samples collected along Transect B (from downstream to upstream). Dissolved metals data will provide additional information regarding potential groundwater contributions of these analytes to shallow sediment and TZW. DEQ expects the groundwater samples being analyzed for dissolved metals to be filtered in the field directly into laboratory-supplied containers containing preservative. This is consistent with the field procedures used during the Phase 1 FSA.

Tables 9a and 9b. DEQ expects the laboratory method reporting limits (MRLs) and method detection limits (MDLs) to be consistent with those being used by the LWG for the Portland Harbor RI/FS. In addition, DEQ notes NWNG's comment to Table 9b regarding the influence of sample size on the MRLs and MDLs for PAHs. NWNG should be advised that to the maximum extent practicable given the conditions encountered in the field, DEQ expects sufficient sample volumes to be collected to meet the data collection goals of the Phase 2 FSA.

DEQ's review of Table 9a indicates that certain VOCs (e.g., 1,2-dichlorobenzene) and PAHs (e.g., dibenzofuran) are missing from the analyte list for sediments. Tables 9a and 9b should be reviewed for completeness.

Figure 7. DEQ understands that NWNG intends for Transect B borings to be located at the base of the navigation channel slope. If this is the case then it appears the locations of first three Transect B borings (from downstream to upstream) should be shifted further off-shore. This may also be the case for near shore borings GS-01 through GS-05. These borings may be shown higher on the riverbank than intended. The figure should be reviewed and revised as appropriate.

NEXT STEPS

Based on the June 25th meeting discussions, DEQ has approved NWNG beginning Step 1 during the week beginning July 2nd. Prior to initiating Step 1 sampling DEQ expects NWNG to provide a written addendum that documents the conditions contained in this letter have been fully

incorporated into the Phase 2 FSA. The addendum should include revised versions of tables 7, 8, and 9, and Figure 7. The addendum should also address DEQ's comments. DEQ's written approval of the Phase 2 FSA will be provided after the addendum has been received and reviewed for completeness.

In addition, during a meeting on May 21st NWNG informed DEQ that the scope of work for the Phase 2 FSA was going to be expanded to include water column sampling. DEQ understands that the details of this work will be provided in a separate document and that the work will be conducted within the timeframe of the Phase 2 FSA.

DEQ appreciates the efforts NWNG is making to conduct offshore drilling and sampling work during the earliest available time period.

Prior to July 2nd contact me with questions regarding this letter. I will be on vacation from July 2nd through July 6th. During my absence contact Henning Larsen (503/229-5527) as needed.

Sincerely,

Dana Bayuk
Project Manager
Portland Harbor Section

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